

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Math 10F&PC Chapter 2 Trigonometry

### 2.1 The Tangent Ratio

#### What is the tan ratio and what do we use it for?

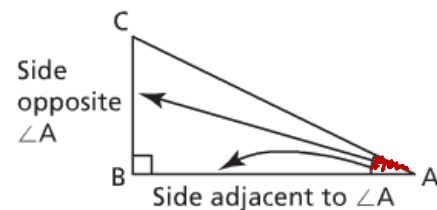
We name the sides of a right triangle in relation to one of its acute (less than  $90^\circ$ ) angles. The side that is across from the right angle is the hypotenuse and it is always the longest side. The other sides are labeled opposite and adjacent (touching) in respect to the angle in question.

#### The Tangent Ratio

$$\tan \theta = \frac{\text{opp.}}{\text{Adj.}}$$

If  $\angle A$  is an acute angle in a right triangle, then

$$\tan A = \frac{\text{length of side opposite } \angle A}{\text{length of side adjacent to } \angle A} = \frac{O}{A}$$



The value of the tangent ratio is usually expressed as a

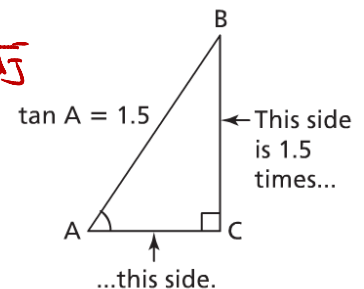
decimal that compares the lengths of the opp. : Adj. sides

For example, if  $\tan A = 1.5$ ; then, in any similar right triangle

with  $\angle A$ , the length of the side opposite  $\angle A$  is 1.5 times

the length of the side adjacent to  $\angle A$ .

$$\frac{\text{opp}}{\text{Adj}}$$



You can use a scientific calculator to determine the measure of an angle:

When you know its tangent, use  $\tan^{-1}(\text{ratio})$

**Example 1:** Determine and Use the Tangent Ratios

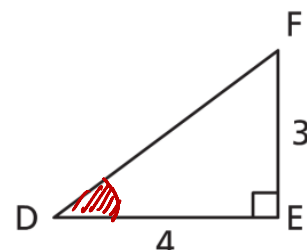
a) Determine  $\tan D$

$$\text{opp.} = 3$$

$$\text{Adj.} = 4$$

$$\tan D = \frac{\text{opp}}{\text{Adj}}$$

$$\tan \angle D = \frac{3}{4} \text{ OR } 0.75$$



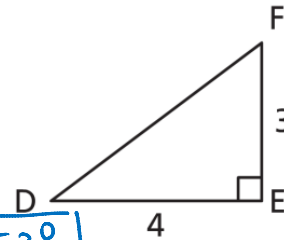
b) Determine the measure of  $\angle D$ .

$$\tan^{-1}\left(\frac{3}{4}\right) \quad \text{OR} \quad \tan^{-1}(0.75) = 36.86^\circ = \boxed{37^\circ}$$

c) Determine the measure of  $\angle F$ .

① Find  $\tan \angle F = \frac{\text{opp}}{\text{Adj}}$   
 $\tan \angle F = \frac{4}{3}$

②  $\angle F = \tan^{-1} \frac{4}{3} = 53.13 \approx \boxed{53^\circ}$



**Example 2:** A 10 ft. ladder leans against the side of a building with its base 4 ft. from the wall. What angle, to the nearest degree, does the ladder make with the ground?

Adj = 4 ft  
 opp = ? = 9.1 ft

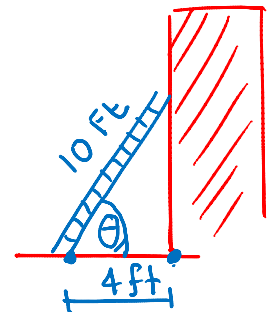
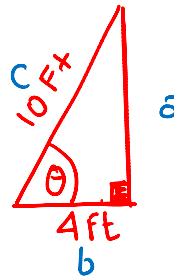
$$c^2 = a^2 + b^2$$

$$a = \sqrt{c^2 - b^2} = \sqrt{10^2 - 4^2}$$

$$a = \text{opp} = 9.1 \text{ ft}$$

$$\tan \theta = \frac{9.1}{4} = 2.27 \quad \theta = \tan^{-1}\left(\frac{9.1}{4}\right)$$

$$\theta = \boxed{66^\circ}$$



**Example 3:**

To the nearest degree, determine the measure of angle X for each value of  $\tan X$

a.  $\tan X = 0.49$

$$\angle x = \tan^{-1}(0.49)$$

$$\angle x = 26.1 \approx \boxed{26^\circ}$$

b.  $\tan X = 1.76$

$$\angle x = \tan^{-1}(1.76)$$

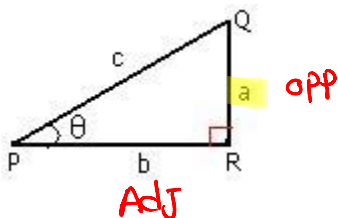
$$\angle x = 60.39 \approx \boxed{60^\circ}$$

**Example 4:**

Determine the tangent ratio and the value of the angle to the nearest degree for each indicated angle.

$\theta = \text{theta}$

$a = 4, b = 5, \theta = ?$



$$\tan \theta = \frac{\text{opp}}{\text{Adj}} = \frac{4}{5} = 0.8$$

$$\angle \theta = \tan^{-1}(0.8) = 38.65 = \boxed{39^\circ}$$

**Assignment: page. 75** Q #3–6, 8, 10, 11, 13–16, 19 & 20